

Fungus-feeding phlaeothripine Thysanoptera in the genus *Holothrips* from Australia and New Caledonia, with a structurally similar new genus, *Holoengythrips*

LAURENCE A. MOUND¹ & DESLEY J. TREE²

¹*Australian National Insect Collection, CSIRO, PO Box 1700, Canberra, ACT 2601. E-mail: laurence.mound@csiro.au*

²*Queensland Primary Industries Insect Collection (QDPC), Department of Agriculture, Fisheries and Forestry, Queensland, Ecosystems Precinct, GPO Box 267, Brisbane, Qld, 4001. E-mail: Desley.Tree@daff.qld.gov.au*

Abstract

Ten species of *Holothrips*, including seven new species, are recognized from Australia, with one further new species from New Caledonia. A new genus, *Holoengythrips*, is described from Australia, with nine new species that look similar to *Holothrips* species in having elongate maxillary stylets that are close together medially for the full length of the head. In contrast to species of *Holothrips*, the species of *Holoengythrips* are strongly sexually dimorphic, with antennal segment VIII separated from VII and the maxillary stylets more slender, and the males have a pore plate on the eighth sternite. *Holoengythrips* is therefore considered to be more closely related to *Hoplandrothrips*.

Key words: *Holothrips*, *Holoengythrips* gen.n., fungus-feeding, maxillary stylets

Introduction

Holothrips is a worldwide genus of fungus-feeding thrips, with the vast majority of species from the tropics and subtropics (Okajima 1987). The stylets of these species are relatively broad, about 3 to 6 microns in diameter (Figs 1–9). This is wider than the 2 to 3 microns of typical Phlaeothripinae, but narrower than the 5 to 10 microns of Idolothripinae (Mound & Palmer 1983). The maxillary stylets of *Holothrips* species are particularly long, being retracted into the head to the level of the compound eyes and close together medially for the full length of the head. In some species these stylets are so long that there is a small recurved portion, or even a loop, within the prothorax. The purpose of this paper is to give an account of the 10 species of *Holothrips* that have been found in Australia, including seven new species together with a further new species from New Caledonia. During the course of these studies, a second genus has been found widespread mostly in eastern Australia with the species remarkably similar in general appearance to those of *Holothrips*. This new genus is therefore described here, together with a further nine new species, but reasons are provided for considering this group of Australian species as probably only distantly related to *Holothrips* species.

Distribution and collecting methods

The distribution patterns of some of the species considered here are rather surprising. One of the smallest, wingless, species has been taken both from Tasmania and Cairns, and a similar species from southern New South Wales and Brisbane. Apparently, the wind systems in eastern Australia can effect long-distance dispersal of some thrips species, particularly those fungus-feeding species that live in relatively moist forest. Curiously, most of the larger species of *Holothrips* discussed here have more restricted distributions, with some species found only in dry sclerophyll *Eucalyptus* forests of southern Australia but others only in the rainforests of more northern areas. Two very different collecting methods have been used to acquire the species discussed here. The most commonly used

method was by beating dead branches over a plastic surface, but many species have been obtained by spraying tree trunks and dead branches with an insecticide, and collecting the thrips that fall onto sheets laid beneath these surfaces as described by Tree and Walter (2012). Collections derived from these two methods often contain quite different species.

Depositories: Holotypes of the new species from Australia are deposited in the Australian National Insect Collection, CSIRO, Canberra [ANIC]. The holotype of the new species from New Caledonia is deposited in the New Caledonia Invertebrate Reference Collection, coden CXMNC, Institut Agronomique néo-Calédonien, New Caledonia [NCIRC]. Paratypes are deposited in the Queensland Primary Industries Insect Collection, QDAFF, Brisbane, Australia [QDPC].

Abbreviations. Pronotal setae: am—anteromarginal, aa—anteroangular, ml—midlateral, epim—epimeral, pa—posteroangular. Tergite IX setae S1—median dorsal pair; iS—intermediate seta between S1 and S2.

***Holothrips* Karny**

Holothrips Karny, 1911: 502. Type species *Holothrips ingens* Karny by monotypy.

Eleven generic names are currently listed as synonyms of this genus, and as a result it includes almost 130 species (ThripsWiki 2014). Okajima (1987) provided a generic diagnosis and a taxonomic account of 72 *Holothrips* species from the Old World, including three species from Australia. For the many New World species in this genus (Mound & Marullo 1996) the only revisionary study is a key to 12 species from Mexico (Johansen & Mojica 1994). The genus is placed in a subgroup of the Phlaeothripinae known as the *Docessissophothrips* genus-group (Dang *et al.* 2014), together with a few related genera. One conclusion reached here is that the apparent length of the mouth cone may not provide a reliable distinction between species.

The Australian species of *Holothrips* share the following character states: Antennae 8-segmented but with the suture between VII–VIII variably incomplete or even absent and thus producing a 7-segmented condition; antennal segment III with 3 sensoria, IV with 4; maxillary stylets 3–6 microns wide, retracted to compound eyes, close together medially for full length of head, often with a small or large loop within the prothorax; pronotum transverse, with 5 pairs of major setae, notopleural sutures complete; fore tarsus with tooth in both sexes; fore wing parallel-sided, with duplicated cilia; metanotum usually with some small discal setae on anterior third, median setal pair weak; mesothoracic sternopleural sutures present, often long; pelta without campaniform sensilla; tergites II–VI with 2 pairs of wing-retaining setae, but anterior pair on each tergite often weakly developed, both pairs often weak or absent on VII; tergite IX major setae long, setae iS short; tube shorter than head, commonly yellow in part with grey terminal band; male sternites with no pore plate on VIII, sternites IV–VII commonly with paired areas of specialized reticulation.

Key to *Holothrips* species from Australia

1. Mesoeusternum anterior margin eroded medially with mesopresternum projecting posteriorly into this eroded area (Figs 17, 18); inter-antennal distance 1.0–2.0 times as wide as antennal segment I (Figs 1, 3); antennal segments VII–VIII with suture complete dorsally and ventrally 2
2. Mesoeusternum anterior margin complete and transverse (Figs 29, 30); inter-antennal distance less than 0.8 times as wide as segment I; antennal segments VII–VIII with suture varying, either absent or complete ventrally but usually not complete dorsally 3
3. Inter-antennal distance at least 1.5 times width of segment I (Fig. 3) *eurytis* sp.n.
4. Inter-antennal distance 1.0 times width of segment I (Fig. 1) *australis*
5. Body bicoloured, pterothorax brown laterally but paler medially, tergites II–VII brown with posterior margin yellow, tergites VIII–IX yellow; antennal segments I–II largely yellow *lamingtoni* sp.n.
6. Thorax and abdomen uniformly brown, antennal segment I usually brown 4
7. Mid and hind tibiae yellow in sharp contrast to brown femora 5
8. Mid and hind tibiae brown to light brown, or yellow with brown shadings, but never sharply paler than femora 9
9. Apterous; metanotal sculpture of concentric reticulation (Fig. 21) *circulus* sp.n.
10. Macropterous or micropterous; metanotal sculpture different or absent 6
11. Antennal segment III no more than 1.8 as long as wide; postocellar setae long and capitate *frerei* sp.n.
12. Antennal segment III 1.9–2.1 times as long as wide; postocellar setae acute, usually shorter than length of one hind ocellus. 7

7. Pelta broad, basal width more than 1.7 times median length (Fig. 22); tube brown subterminally before terminal grey band *bunyaai* sp.n.

- Pelta elongate, basal width less than 1.3 times median length (Figs 11, 12); tube yellow subterminally before terminal grey band 8

8. Mouth cone long, projecting beyond rounded labium (Fig. 30), extending across prosternum between fernal sclerites. *speciosissimus*

- Mouth cone shorter, not projecting beyond rounded labium (Fig. 29) *oceanicus*

9. Postocular setae capitate (Fig. 4); tube with sides straight and evenly tapering to apex (Fig. 15) *federicae* sp.n.

- Postocular setae long and pointed; tube slightly constricted beyond widened base, and more sharply constricted at apex (Fig. 16) 10

10. Antennal segment III brown, yellow only at extreme base, IV–VI uniformly brown; tube golden brown; fore wings distinctly shaded *notialis* sp.n.

- Antennal segment III yellow at least in basal half, IV–VI yellow at base (Fig. 17); tube dark brown; fore wings very weakly shaded [New Caledonia] *lafoae* sp.n.

***Holothrips australis* (Mound)**

(Figs 1, 17, 19, 31)

Adelothrips australis Mound, 1974: 12.

This species seems to be restricted to southern Australia. It was based on one female macroptera taken at Canberra, together with two specimens from Bordertown, South Australia, and another from near Adelaide. It shares with *eurytis* sp.n. described below the curious structure of the mesoeusternum anterior margin being eroded medially, with the mesopresternum projecting posteriorly into this eroded area (Fig. 17). This occurs in both macropterae and apterae, but in macropterae the lateral margins of the mesopresternum are fused to the mesoeusternum. A similar posterior projection of the mesopresternum has not previously been reported from any species of Phlaeothripidae, although fusion of the mesopresternum and mesoeusternum is known in *Asianthrips* from southern Japan (see Dang *et al.* 2014). The male has specialised areas of reticulation laterally on sternites (V) VI–VIII, but these are variable in their extent (Fig. 31).

Material studied. Australian Capital Territory, Canberra, Black Mt., holotype female macroptera from dead branch, 2.iii.1968 (LAM 525); Oakey Hill, 2 male apterae from *Eucalyptus blakeleyi* dead twigs, 21.iv.2011. South Australia, 50k south of Keith, 5 female macropterae, 1 male macroptera, 2 female and 7 male apterae, from *Eucalyptus* dead branches, 14.iii.2011.

***Holothrips bunyaai* sp.n.**

(Figs 2, 22, 25)

Female macroptera. Body and all femora brown, fore tibiae and tarsi brown, mid and hind tibiae and tarsi yellow; antennal segment I brown, II yellow, III yellow in basal two-thirds (Fig. 25), IV–III brown; fore wings weakly shaded; major setae pale. Head slightly swollen behind large eyes, cheeks weakly concave before widening to posterior margin (Fig. 2); dorsal surface with extensive reticulate areas; postocular setae longer than eye, weakly capitate; maxillary stylets with no loop within prothorax. Antennae 8-segmented, VIII fused to VII with partial suture ventrally. Pronotum transverse, weakly reticulate near anterior and posterior margin, with 5 pairs of slender capitate major setae; fore tarsal tooth about half as long as tarsal width. Prosternal ferna not meeting medially; mesopresternum transverse; metathoracic sternopleural suture long. Mesonotal lateral setae capitate. Metanotum without sculpture medially, median setae small and acute, anterior third with one pair of minor setae (Fig. 22). Fore wing uniformly broad, about 17 duplicated cilia; sub-basal setae long and capitate, arising in a broadly-based triangle. Pelta broad, weakly reticulate (Fig. 22); tergites II–VII with 2 pairs of wing-retaining setae, anterior pair weak on each tergite or absent on VII, major setae capitate; tergite IX setae long and finely acute.

Measurements (holotype female in microns). Body length 3200. Head, length 400; width behind eyes 300; postocular setae 130. Pronotum, length 210; width 420; major setae: am 55, aa 50, ml 55, epim 100, pa 100. Fore wing length 1300; sub-basal setae 55, 70, 100. Tergite IX setae: S1 250, iS 55, S2 280. Tube length 250. Antennal segments III–VI [VII–VIII] length 105, 110, 95, 85, [100].

Material studied. Holotype female macroptera, **Queensland**, Bunya Mts, Pitta Cottage, from bark spray, 22.xii.2010 (G. Monteith).

Paratypes: 4 females taken with holotype.

Comments. Although similar to *oceanicus* and *speciosissimus* in appearance, this species differs in the broader pelta, and the colour of the tube.

***Holothrips circulus* sp.n.**

(Figs 5, 14, 21)

Female aptera. Body yellowish brown, anterior third of head brown with remainder yellow, pronotum brownish yellow, tube yellow on distal third before grey band at apex; femora brown, mid and hind tibiae and tarsi clear yellow; antennal segments I–II yellow, III brownish yellow, IV–VIII brown; major setae shaded.

Head without sculpture except on posterior third; eyes small but distinctly prolonged ventrally, ocelli close together (Fig. 5); postocular setae long and capitate; maxillary stylets with moderately wide loop within prothorax. Suture between antennal segments VII–VIII present on ventral surface only. Pronotum transverse, almost without sculpture, with 5 pairs of capitate major setae, notopleural sutures complete; fore tarsal tooth less than half as long as tarsal width. Prosternal ferna not meeting medially; mesopre sternum transverse but slender medially, mesoeusternal anterior margin entire; metathoracic sternopleural suture long and slender. Mesonotal setae small. Metanotum with concentric sculpture medially (Fig. 21), major setae small arising medially, anterior third with two pairs of minor setae. Pelta reticulate, broadly triangular with truncate apex; wing-retaining setae minute and straight, major setae long and capitate; tergite IX setae long and finely acute; tube shorter than head (Fig. 14).

Measurements (holotype female in microns). Body length 3000. Head, length 400; width behind eyes 300; postocular setae 125. Pronotum, length 200; width 400; major setae: am 80, aa 55, ml 55, epim 70, pa 95. Tergite IX setae: S1 240, iS 50, S2 225. Tube length 225. Antennal segments III–VI [VII–VIII] length 110, 100, 85, 75, [95].

Male aptera. Similar to female except, ocelli absent; fore femora swollen, fore tarsal tooth about as long as tarsal width; sternites V–VII with weak areas of reticulate sculpture.

Measurements (paratype male in microns). Body length 2800. Tergite IX setae: S1 200, iS 55, S2 50.

Material studied. Holotype female aptera, **Queensland**, Springbrook, [30km West of Coolangatta], from bark spray in rainforest, 30.xi.2011 (G. Monteith).

Paratypes: 1 female, 2 male apterae collected with holotype.

Comments. The metanotal sculpture of this species is distinctive, although it is based only on apterae, and winged individuals can be expected to be rather different.

***Holothrips eurytis* sp.n.**

(Figs 3, 18)

Female macroptera. Body legs and antennae brown, except basal third of antennal segment III yellow; fore wings uniformly weakly shaded; major setae all pale. Head with cheeks strongly convex behind eyes then concave before widening to posterior margin; interantennal process exceptionally wide (Fig. 3); dorsal surface reticulate posterolaterally, with almost no sculpture medially; postocular setae long and weakly capitate; maxillary stylets retracted to eyes, close together medially, with wide loop at level of prothorax. Antennae 8-segmented, VIII broadly joined to VII, III with 3 sensoria, IV with 4. Pronotum transverse, reticulate on anterior and posterior thirds, with 5 pairs of weakly capitate major setae, notopleural sutures complete; fore tarsal tooth about half as long as tarsal width. Prosternal ferna not meeting medially; mesopre sternum transverse, fused laterally to mesoeusternal and projecting medially into mesoeusternal anterior margin (Fig. 18); metathoracic sternopleural suture short. Mesonotal setae small. Metanotum without sculpture medially, median setae arise on posterior half, anterior third with at least one pair of minor setae. Fore wing uniformly broad, 16–20 duplicated cilia; sub-basal setae small and capitate, arising in a triangle. Pelta reticulate; tergites II–VI with one pair of weakly curved wing-retaining setae and transverse row of 6–10 discal setae, major setae capitate; tergite IX setae long and finely acute; tube much shorter than head.

Measurements (holotype female in microns). Body length 4050. Head, length 500; width behind eyes 400; postocular setae 100. Pronotum, length 280; width 550; major setae: am 70, aa 60, ml 75, epim 90, pa 110. Fore wing length 1500; sub-basal setae 60, 70, 60. Tergite IX setae: S1 250, iS 75, 280. Tube length 250. Antennal segments III–VIII length 110, 110, 100, 90, 55, 35.

Female microptera. Similar to macroptera but metanotum reticulate and wing-retaining setae straight or absent.

Male microptera. Similar to female except, fore tarsal tooth slightly more robust; mesopre sternum divided into three sections, mesoeusternal anterior margin weakly concave but not eroded; metanotum reticulate, with 2 pairs of minor setae on anterior third; sternites V–VIII with variable areas of reticulate sculpture.

Measurements (paratype male in microns). Body length 3100. Head, length 450; width behind eyes 380; postocular setae 85. Pronotum, length 300; width 430. Fore wing lobe 180. Tergite IX setae: S1 170, iS 55, S2 75. Tube length 210.

Material studied. Holotype female macroptera, **Queensland**, Brisbane, Mt Coot-tha, from *Eucalyptus* dead branches, 14.x.2006 (LAM 4966).

Paratypes, mostly beaten from *Eucalyptus* branches: 4 female macropterae, 2 female micropterae, 2 male micropterae, taken with holotype; same locality, 1 female microptera, 29.x.2007, 1 female macroptera, 1.xi.2007; Brisbane, Gap Creek Reserve, 1 female microptera, 17.i.2006; Girraween, 1 female macroptera and 1 female microptera, 29.xii.2011; Mt Gammy, 1 female macroptera, 15.ix.2009. **New South Wales**, Werrikimbe, 1 female macroptera, 7.xii.1997. **Australian Capital Territory**, Black Mt., 1 female, 1 male micropterae, 18.iv.2009, 1 female macroptera and 1 female microptera, 26.ii.2011; Weston, 1 male macroptera, 1.x.2006; Mulligan's Flat, 2 female macropterae and 1 female microptera, 6.xii.2003.

Comments. The interantennal projection is much broader in this species than in *australis*, but in males the mesoeusternal anterior margin is only concave not eroded medially.

Holothrips federicae sp.n.

(Figs 4, 15, 20)

Female macroptera. Body, legs and antennae brown, antennal segment III yellow at extreme base, tube golden, yellow subterminally before terminal grey band; fore wings very weakly shaded; major setae pale. Head slightly swollen behind large eyes, cheeks weakly concave before widening to posterior margin (Fig. 4); dorsal surface weakly reticulate in posterior third; postocular setae capitate, longer than eye; maxillary stylets with small loop within prothorax. Antennae 8-segmented, VIII fused to VII usually without suture. Pronotum transverse, reticulate near posterior margin, with 5 pairs of slender capitate major setae; fore tarsal tooth small, less than half as long as tarsal width. Prosternal ferna not meeting medially; mesopre sternum transverse but narrowed submedially; metathoracic sternopleural suture short. Mesonotal lateral setae capitate. Metanotum without sculpture medially, median setae fine and acute, anterior third without minor setae. Fore wing uniformly broad, about 10 duplicated cilia; sub-basal setae capitate, arising in a triangle. Pelta broadly triangular, weakly reticulate (Fig. 20); tergites II–VII with 2 pairs of wing-retaining setae, anterior pair weak on each tergite or absent on VII, major setae capitate; tergite IX setae long and finely acute (Fig. 15).

Measurements (holotype female in microns). Body length 2950. Head, length 330; width behind eyes 280; postocular setae 110. Pronotum, length 190; width 400; major setae: am 70, aa 75, ml 95, epim 100, pa 95. Fore wing length 1100; sub-basal setae 60, 75, 80. Tergite IX setae S1 200, iS 60, S2 230. Tube length 230. Antennal segments III–VI [VII–VIII] length 95, 85, 75, 55, [85].

Female microptera. Similar to macroptera except, antennal segment II largely yellow, mid and hind tibiae yellow washed with brown; ocelli absent; eyes small, slightly longer ventrally than dorsally; metanotum weakly reticulate; wing lobe with 2 capitate setae; tergal wing-retaining setae small and straight.

Measurements (paratype female in microns). Body length 2400. Fore wing lobe length 55.

Male microptera. Similar to female, tergite IX and dorsal surface of tube with minute dentate microtrichia; tergite IX setae S2 short but not stout; sternites without reticulate areas.

Measurements (paratype male in microns). Body length 2350. Tergite IX setae S1 160, iS 50, S2 55.

Material studied. Holotype female macroptera, **Queensland:** Mt Mitchell [80km southwest of Brisbane], by bark spray in rainforest, 27.ii.2011 (Monteith & Turco).

Paratypes: **Queensland**, 2 female macropterae, 3 male micropterae, taken with holotype; Brisbane, Mt Glorious, 1 female macroptera, 9.iii.2006, 1 male microptera, 29.x.2008; Brisbane, Mt Coot-tha, 1 female, 1 male microptera, 29.vi.2008; Brisbane Forest Park, 1 female macroptera, 2 male micropterae, i.2006, iv.2011, iii.2013; Brisbane, The Gap, 1 male microptera, 8.i.2009; Mt Edith, 1 male microptera, 4.xii.2010; Mudlo N.P., 1 male microptera, 21.xii.2011; Bunya Mts, Pitta College, 1 female macroptera, 22.xii.2010; Bulburin N.P. [120km NW of Bundaberg], 1 female macroptera, 2 male micropterae, 12.vii.2012; Eungella, 2 male micropterae, 14.iv.2011; Mt Bartle Frere, 2 male micropterae, 19.xi.2009. **New South Wales**, Sassafras, 1 female microptera, 29.vii.2012.

Comments. As is clear from the data listed, this species has been taken widely in Queensland, but always in low numbers.

Holothrips frerei sp.n.

(Figs 6, 10, 26)

Female microptera. Body and femora brown, tube paler almost yellow on distal third before apical grey band; tibiae and tarsi yellow; antennal segment I light brown, II yellow, III yellow on basal third then brown (Fig. 26), IV–VIII brown but IV paler on basal third with pedicel brown; major setae pale. Head without sculpture except on posterior third (Fig. 6); eyes small but distinctly prolonged ventrally, ocelli absent; cheeks slightly swollen behind eyes; postocellar setae well-developed and capitate; postocular setae long and capitate; maxillary stylets with small loop at level of prothorax. Antennal segments short, VII–VIII usually with no suture. Pronotum transverse, weakly sculptured at posterior, with 5 pairs of capitate major setae, notopleural sutures complete; fore tarsal tooth scarcely half as long as tarsal width. Prosternal ferna not meeting medially; mesopre sternum transverse but eroded submedially; metathoracic sternopleural suture short. Mesonotal lateral setae capitate. Metanotum reticulate, median setae capitate (Fig. 10), anterior third with one pair of minor setae. Fore wing lobe with 2 capitate major setae. Pelta reticulate, D-shaped (Fig. 10); tergal wing-retaining setae small and straight, major setae capitate; tergite IX setae S1 weakly capitate, S2 long and finely acute; tube much shorter than head.

Measurements (holotype female in microns). Body length 2500. Head, length 300; width behind eyes 230; postocular setae 85. Pronotum, length 175; width 380; major setae: am 75, aa 75, ml 85, epim 75, pa 95. Fore wing lobe 90. Tergite IX setae: S1 150, iS 55, S2 160. Tube length 200. Antennal segments III–VI [VII–VIII] length 80, 80, 55, 53 [75].

Male microptera. Similar to female microptera except, fore tarsal tooth almost as long as tarsal width; sternites V–VII without any areas of reticulate sculpture, tergite IX setae S2 small and stout.

Measurements (paratype male in microns). Body length 2200. Tergite IX setae S1 110, iS 50, S2 50.

Material studied. Holotype female microptera, **Queensland**, Mt Bartle Frere, from bark spray of trees and logs, 18.xi.2009 (Monteith & Turco).

Paratypes: 3 male micropterae taken with holotype.

Non-paratypes: **Queensland**; Paluma, 1 female microptera, 15.ix.2010; Lenthall's Dam [50km south of Maryborough], 1 female macroptera, 25.iv.2012. **New South Wales**, Sassafras, 1 male microptera, 29.vii.2012.

Comments. The micropterae of this species are unusual in that they lack any ocelli, no reticulate areas are visible on the sternites of the available males, and the upper surface of tergite IX and the tube bear minute dentate microtrichia. The three specimens excluded from the type series have antennal segment III similarly short, but the mesonotal and postocellar setae are not capitate, although the male from Sassafras has dentate microtrichia on tergite IX and the upper surface of the tube.

Holothrips lafoae sp.n.

(Figs 9, 13, 27, 32)

Female macroptera. Body and legs brown, tarsi paler; antennal segment I brown, II paler at apex, III yellow but shaded in apical third, IV–VI yellow at base (Fig. 27); tube dark brown; fore wings weakly shaded on basal third;

major setae pale. Head slightly swollen behind large eyes, cheeks weakly concave before widening to posterior margin (Fig. 9); dorsal surface extensively reticulate except in ocellar region; postocular setae long and acute, postocellar setae slightly longer than one hind ocellus; maxillary stylets with small loop within prothorax. Antennal segment VIII fused to VII with no visible suture. Pronotum transverse, weakly reticulate at posterior margin, with 5 pairs of slender pointed to weakly capitate major setae; fore tarsal tooth about half as long as tarsal width. Prosternal ferna not meeting medially; mesopresternum transverse; metathoracic sternopleural sutures long and slender. Mesonotal lateral setae small but capitate. Metanotum with no sculpture medially, median setae acute, anterior third with 2–4 minor setae. Fore wing uniformly broad, about 20 duplicated cilia; sub-basal setae S1 and S2 weakly capitate, S3 finely acute, arising almost in straight line. Pelta elongate with broad lateral wings, weakly reticulate (Fig. 13); tergites II–VII with 2 pairs of sigmoid wing-retaining setae, both pairs small on VII, major setae long and pointed; tergite IX setae long and finely acute; tube slightly constricted beyond widened base, and more sharply constricted at apex.

Measurements (holotype female in microns). Body length 4300. Head, length 400; width behind eyes 300; postocular setae 200. Pronotum, length 230; width 450; major setae: am 85, aa 55, ml 175, epim 110, pa 210. Fore wing length 1500; sub-basal setae 75, 110, 150. Tergite IX setae: S1 280, iS 75, S2 330. Tube length 330. Antennal segments III–VI [VII–VIII] length 125, 125, 100, 90, [100].

Male macroptera. Similar to female in colour and structure, except, fore tarsal tooth almost as long as tarsal width, fore femora swollen, pronotum robust with strong median apodeme; sternites VI–VII with large areas of reticulate sculpture (Fig. 32), tergite IX setae S2 stout.

Measurements (paratype male in microns). Body length 4100. Tergite IX setae S1 280, iS 55, S2 85.

Material studied. Holotype female macroptera, **New Caledonia**, La Foa, from dead *Ocimum* stems, 5.iv.2012 (LAM 5557), in NCIRC.

Paratypes: 6 females, 2 males with larvae taken with holotype; Farino, 1 female, 7.x.2004, in NCIRC, ANIC and QDPC.

Comments. Using the key to species by Okajima (1987) this species runs only to *celebensis* amongst those species regarded as having a long mouth cone, but *celebensis* has dark brown antennae. From New Caledonia, two females and one male have been studied taken in a malaise Trap on Col d'Amiens in 2008. These specimens are similar to *lafoae* in colour and structure but much larger, with the postocellar setae about as long as the distance between the compound eyes.

Holothrips lamingtoni sp.n.

(Figs 7, 28)

Female macroptera. Body bicoloured, mainly yellowish brown, mesothorax brown also metathorax laterally, tergite I yellow, II–VII brown on anterior thirds but yellow on posterior margins, VIII–IX yellow, tube golden but almost yellow on distal fifth before grey apex; antennal segments I–III concolourous with head, IV–VIII increasingly brown (Fig. 28); mid and hind femora brown with tibiae and tarsi sharply yellow; fore legs uniformly light brown; antennae shading from yellow at base to brown at apex; fore wing weakly shaded; all major setae light brown. Head with cheeks slightly swollen behind eyes then weakly concave to almost straight (Fig. 7); dorsal surface reticulate posterolaterally, with almost no sculpture medially; postocular setae long and acute; maxillary stylets retracted to eyes, close together medially but wider apart at level of pronotum. Antennae 8-segmented, VIII fused to VII with suture variably developed ventrally. Pronotum transverse, weakly sculptured on anterior and posterior thirds, with 5 pairs of pointed major setae, notopleural sutures complete; fore tarsal tooth about half as long as tarsal width. Prosternal ferna not meeting medially; mesopresternum transverse, mesoeusternal anterior margin entire; metathoracic sternopleural sutures long and slender. Mesonotal lateral setae well-developed. Metanotum without sculpture medially, major setae small arising medially, anterior third with one or two pairs of minor setae. Fore wing uniformly broad, about 26 duplicated cilia; sub-basal setae S1 and S2 weakly capitate, S3 long and acute, arising almost in a straight line. Pelta reticulate, elongate with small lateral wings; tergites II–VI with two pairs of wing-retaining setae, these setae very small on VII, major setae long and finely pointed; tergite IX setae long and finely acute; tube shorter than head.

Measurements (holotype female in microns). Body length 4400. Head, length 500; width behind eyes 350;

postocular setae 175. Pronotum, length 200; width 500; major setae: am 75, aa 75, ml 130, epim 150, pa 175. Fore wing length 1700; sub-basal setae 100, 130, 200. Tergite IX setae: S1 325, iS 100, S2 300. Tube length 380. Antennal segments III–VI [VII–VIII] length 160, 155, 125, 100, [110].

Male macroptera. Similar to female except, fore tarsal tooth slightly more robust; sternites V–VI (rarely IV) with variable areas of reticulate sculpture.

Measurements (paratype male in microns). Body length 4000. Tergite IX setae S1 300, iS 75, S2 85.

Material studied. Holotype female, **Queensland**, Lamington, O'Reilly's, from *Lophostemon confertus* dead leaves and nuts, 13.iii.2007 (DJT 431).

Paratypes: **Queensland**, at same locality as holotype, 6 females, 6 males from dead branches and leaves of *Lophostemon* and *Nothofagus*, 13–14.iii.2007; at same site, 3 females, 9–11.x.2006. Brisbane, Mt Glorious, 1 female, 19.i.2006, 2 males, 9.iii.2006, 1 female, 22.iii.2007, 2 females, 2.viii.2008; Brisbane Forest Park, 1 female, 1 male, 10.iii.2006; Springbrook, 1 female, 2 males, 29.xi.2011; Mt Mitchell, 3 females, 2 males 27.ii.2011; Eungella N.P., 1 female, 1 male, 27.xi.2009. **Tasmania**, Huon Valley, 1 female, 31.i.2001, Picton Valley, 1 female, 29.v.2001. **New South Wales**, Lilyvale, 1 female, 4.ii.1910.

Comments. This species is readily distinguished from the other members of the genus in Australia by the bicoloured tergites on each of which the posterior third is sharply yellow.

***Holothrips notialis* sp.n.**

(Figs 8, 16, 23, 24)

Female macroptera. Body, legs and antennae brown, antennal segment III yellow at extreme base, tube golden brown; fore wings shaded; major setae pale. Head slightly swollen behind large eyes, cheeks weakly concave before widening to posterior margin (Fig. 8); dorsal surface extensively reticulate except in ocellar region; postocular setae long and acute, postocellar setae shorter than one hind ocellus; maxillary stylets with small loop at level of prothorax. Antennae 8-segmented, VIII fused to VII with variable ventral suture. Pronotum transverse, reticulate at anterior and posterior margins, with 5 pairs of slender pointed major setae; fore tarsal tooth about half as long as tarsal width. Prosternal ferna not meeting medially; mesopre sternum transverse; metathoracic sternopleural sutures long. Mesonotal lateral setae capitate. Metanotum weakly reticulate medially, median setae small and acute, anterior third with 2–4 minor setae. Fore wing uniformly broad, 12–14 duplicated cilia; sub-basal setae bluntly pointed to finely acute, arising almost in straight line. Pelta elongate, irregularly triangular, weakly reticulate (Figs 23, 24); tergites II–VII with 2 pairs of wing-retaining setae, anterior pair weak on each tergite, both pairs small and straight on VII, major setae finely acute; tergite IX setae long and finely acute, iS setae often duplicated (Fig. 16); tube slightly constricted beyond widened base, and more sharply constricted at apex (Fig. 16).

Measurements (holotype female in microns). Body length 3300. Head, length 400; width behind eyes 300; postocular setae 130. Pronotum, length 175; width 450; major setae: am 50, aa 85, ml 100, epim 140, pa 150. Fore wing length 1300; sub-basal setae 75, 105, 150. Tergite IX setae: S1 275, iS 75, S2 280. Tube length 280. Antennal segments III–VI [VII–VIII] length 120, 110, 95, 85, [100].

Male macroptera. Variable in size, small male similar to female, large male with fore tarsal tooth as long as tarsal width, fore femora swollen, pronotum robust with strong median apodeme; sternites IV–VII with areas of reticulate sculpture, tergite IX setae S2 stout.

Measurements (paratype male in microns). Body length 3100. Tergite IX setae S1 275, iS 75, S2 85.

Material studied. Holotype female macroptera, **New South Wales**: Talaganda, Lowden Forest Park, from *Eucalyptus* dead nuts, 27.ii.2011 (DJT 1184).

Paratypes (all macropterae): 6 females, 6 males taken with holotype. **Australian Capital Territory**, Namadji, 2 females from dead *Eucalyptus*, x.2010. **South Australia**, Adelaide, Stirling, 3 females, 3 males from *Eucalyptus* dead nuts, 8.iv.2004; Adelaide Hills, Wotton Scrub, 1 female, 1 male, 10.i.2006; Coorong to Kingston, 2 females, 1 male from *Eucalyptus* dead branches, 11.iii.2011. **Victoria**, Nelson, 1 male from dead *Eucalyptus* nuts, 5.x.2013. **Tasmania**, 17 Mile Plain, 1 female, 1 male from *Eucalyptus obliqua* dead leaves, 12.iii.2010; Lake Pedder, 1 female, iii.2004.

Comments. This appears to be the southern counterpart of the northern species *federicae*. In both of them the body, legs and antennae are uniformly brown, but the setae are long and pointed and the tube is a different shape (Figs 15, 16).

***Holothrips oceanicus* Okajima**

(Figs 12, 29)

Holothrips oceanicus Okajima, 1987: 37.

Based originally on a single female taken in the eastern part of central New South Wales, this species has now been collected widely from *Eucalyptus* in south eastern Australia as far north as Brisbane, with one female taken in New Caledonia. In the original description *oceanicus* was distinguished from *speciosissimus* only in the key. This key separates the 72 Old World species into two subgroups, based on whether the mouth cone is rounded (Fig. 29) or long and pointed (Fig. 30). Recent examination of all the available specimens has found no consistent differences in structure between *oceanicus* and *speciosissimus*, apart from the mouth cone. The possibility exists that the two names refer to an irregular North-South cline of a single species in the forests of eastern Australia. The larger males of *oceanicus* have tergite IX setae S1 long and acute, whereas smaller males resemble females in having these setae shorter with weakly expanded apices. Sternites V and VI of males have specialised reticulate areas laterally, but as in *speciosissimus*, these reticulations are often weakly developed and difficult to see.

Material studied. Holotype female, **New South Wales**, 20km N of Taralga, dead leafy *Eucalyptus*, 2.iv.1968 (LAM 601), in ANIC.

Further material. **New South Wales:** Gosford, 5 females from dead *Eucalyptus* nuts, 23.xi.1994; Narooma 10km west, 1 female, 3 males, 22.xii.2010; Wallaga Lake, 4 females, 2 males from dead *Eucalyptus* nuts, 27.xii.2010; Moruya, 2 females, 15.ix.2012; Tallaganda, Lowden Forest Park, 6 females, 5 males from dead *Eucalyptus* nuts, 27.ii.2011, same site, 2 females 12.xi.2006, same site, 1 male, 6.viii.2006. **Australian Capital Territory:** Weston, Oakey Hill, 2 females, 1 male on *Eucalyptus blakeleyi* dead twigs, 21.iv.2011; Black Mt., 1 female on dead *Eucalyptus*, 19.xi.2011. **Victoria**, Mallacoota, 7 females, 2 males in dead *Eucalyptus* nuts, 1.iv.2011. **South Australia**, Adelaide Hills, Scott Creek, 1 female in *Eucalyptus* dead nuts, 15.xii.2009. **Queensland:** Brisbane. Mt Cootha, 4 females from dead *Eucalyptus* branches, 14.x.2006; Brisbane Forest Park, 7 females, 7 males on dead branches, various dates 2008–2013; Bribie Is., 1 male, 17.x.2007; Glasshouse Mts, 3 females, 2 males, 4.ix.2012; Stanthorpe, 1 female, 28.xii.2011; Mt Gammy, 1 female, 15.ix.2009; Giraween NP, 1 female from *Eucalyptus* dead nuts, 29.xii.2011; Cape Tribulation, 1 female from bark spray, 7.x.2012. **New Caledonia**, Bourail, 1 female, 14.iv.2012.

***Holothrips speciosissimus* (Karny)**

(Figs 11, 30, 33)

Nesothrips speciosissimus Karny, 1920: 42.

Adelothrips speciosissimus (Karny) Mound, 1974: 16

Holothrips speciosissimus (Karny) Mound & Palmer, 1983: 95

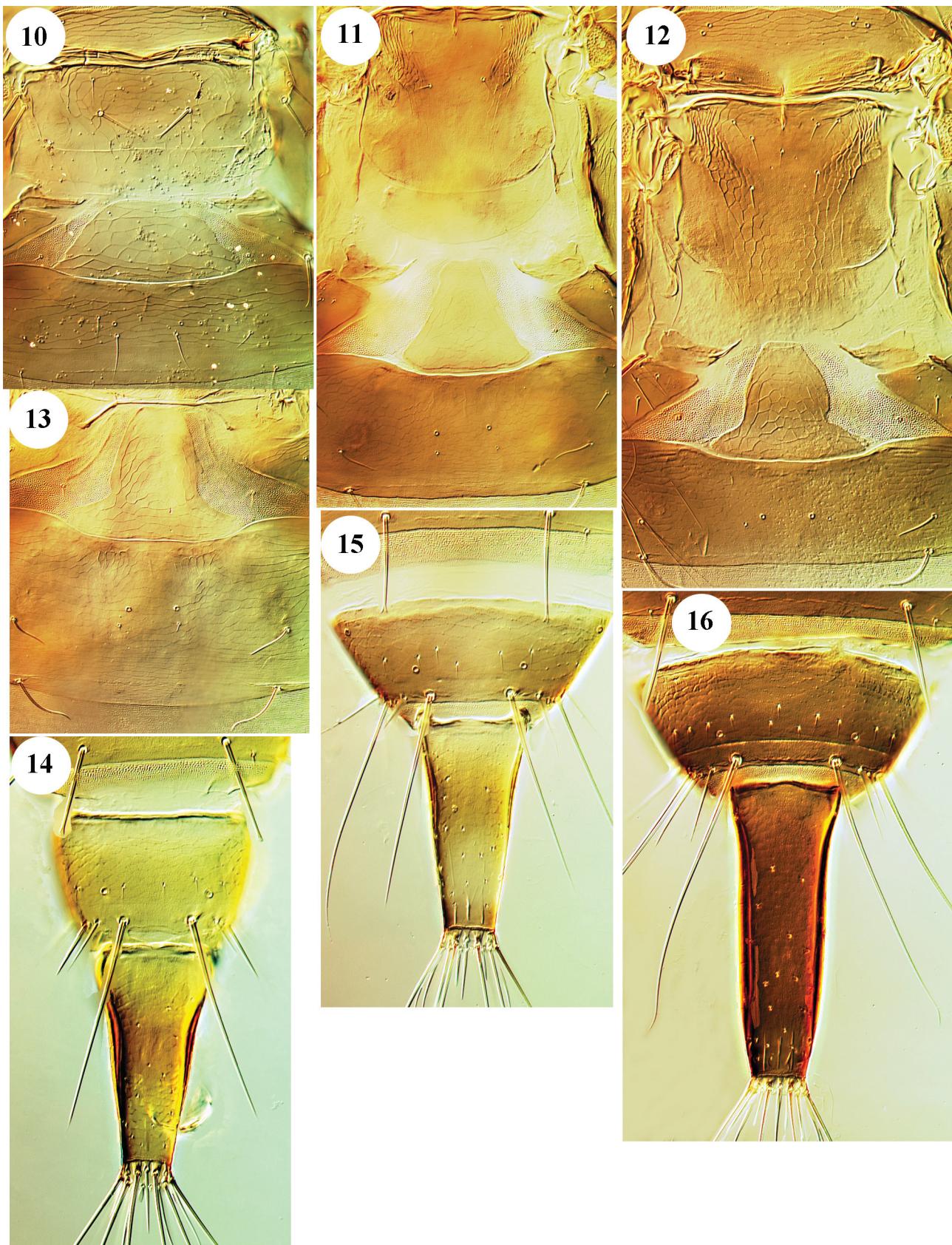
This species was based on a single male collected in Queensland at “Cedar Creek”, a locality that is presumed to be at Mt Tamborine, just south of Brisbane. This specimen is mounted ventral side uppermost, and the labromaxillary complex clearly projects posteriorly well beyond the curve of the labium. Weakly reticulate areas are visible on sternite VI, but on tergite IX the S1 seta is missing on the left side, and on the right side the S1 seta is broken. Only a few specimens have been found that share the elongate condition of the mouth cone (Fig. 30). All of these are from rainforest areas of northern Queensland, and associated males have distinct reticulation on sternites VI and VII. As discussed above, the distinction of *oceanicus* from *speciosissimus* remains unclear. The variation in the apparent length of the mouth cone requires further study, as this possibly does not provide such a secure distinction between groups of species as has previously been considered.

Material studied. Holotype male, **Queensland**, Cedar Creek, [Mt Tamborine?] (Mjöberg 7), in Swedish Museum of Natural History, Stockholm.

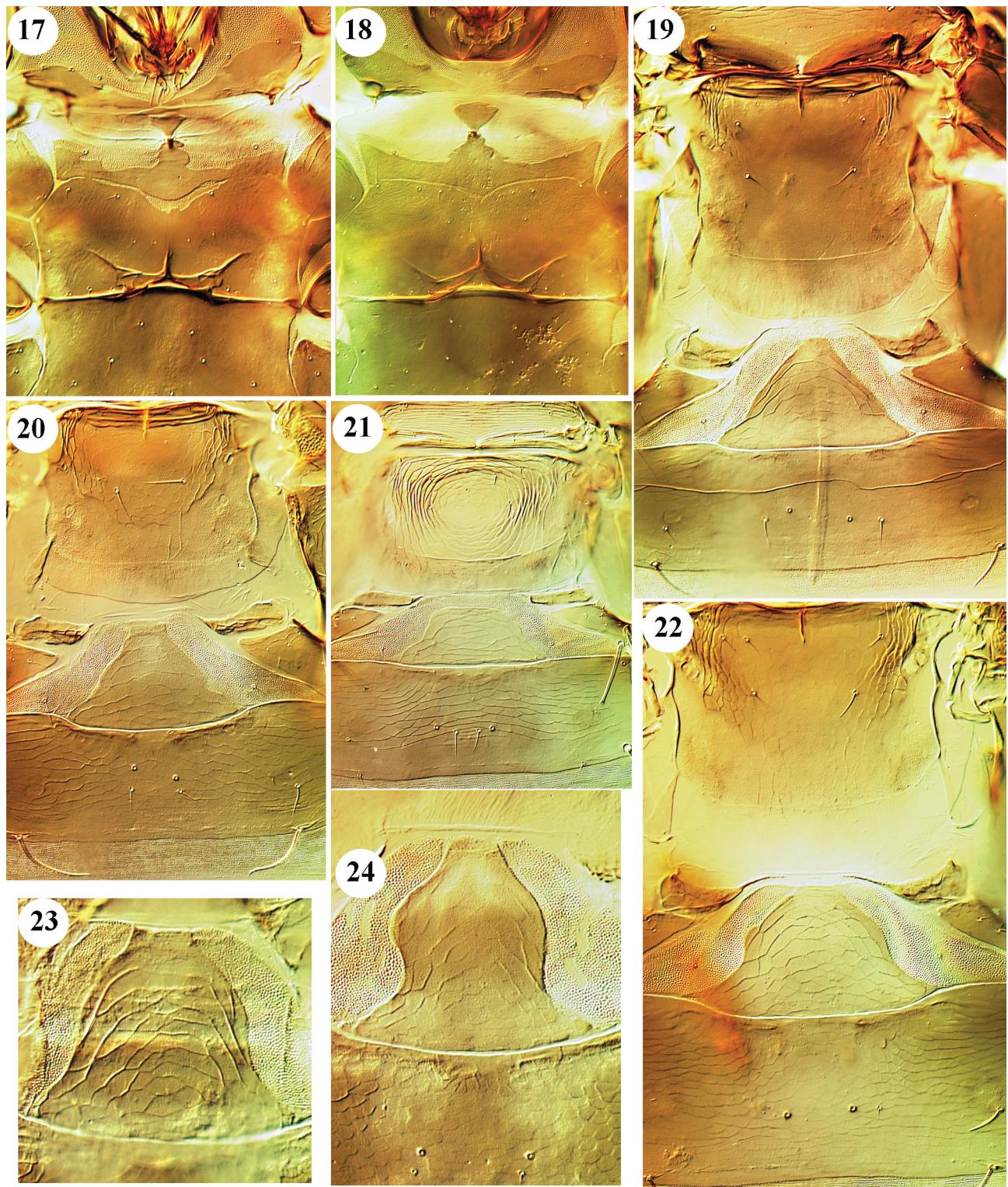
Further material. **Queensland:** Mission Beach, Clump Point, 2 females from dead branches, 21.vii.1968 (in BMNH); Cairns, Crystal Creek, 2 males from dead wood, 4.x.2012; Cairns, Smithfield Conservation Park, 1 female from bark spraying tree buttress, 19.ix.2013; Cape Tribulation, 1 male, 7.vii.1995, 1 male, 18.x.2012; Mt Malloy, 1 female from dead twigs, 5.vii.1995.



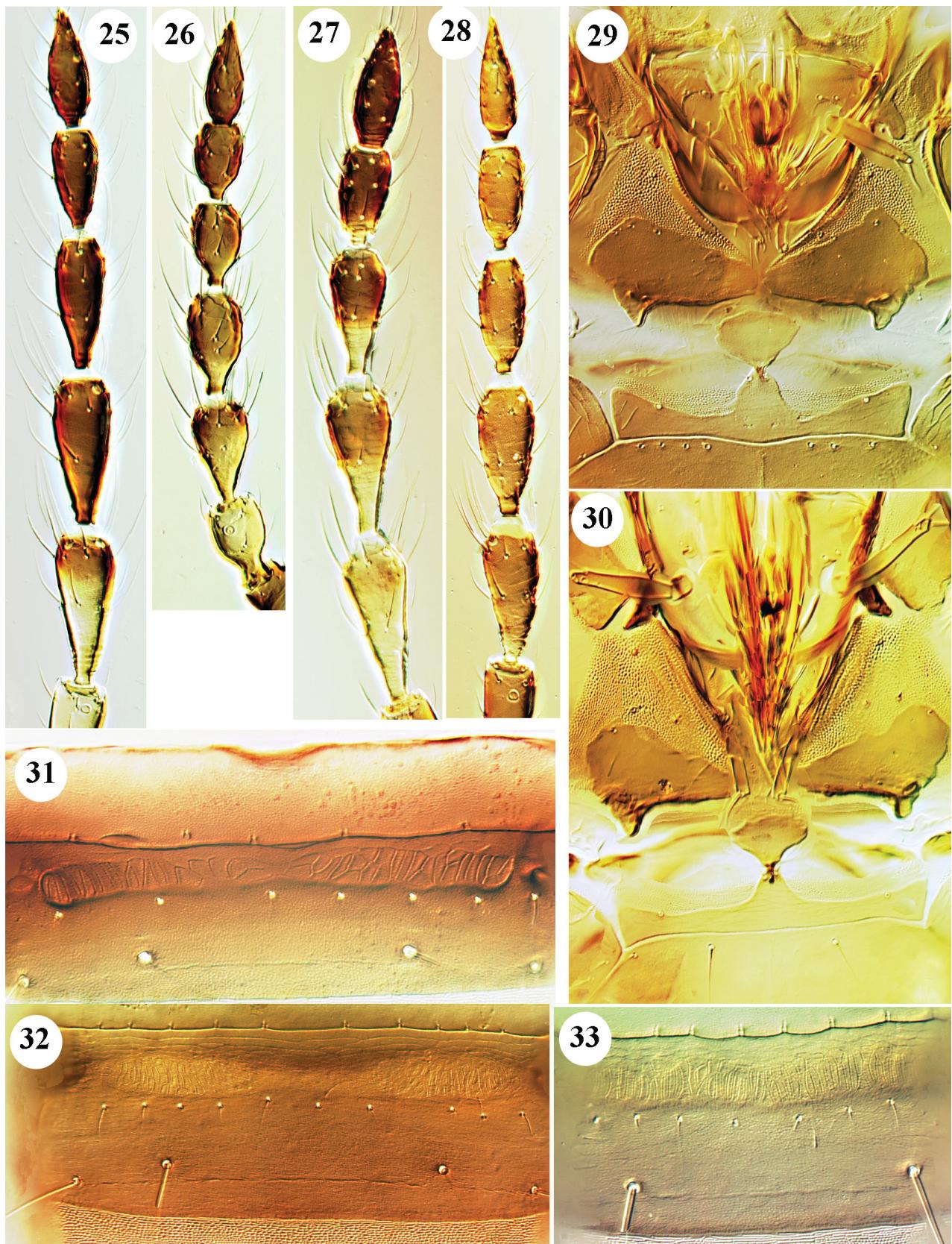
FIGURES 1–9. *Holothrips* from Australia. Heads: (1) *australis*; (2) *bunyai* sp.n.; (3) *eurytis* sp.n.; (4) *federicae* sp.n.; (5) *circulus* sp.n.; (6) *frerei* sp.n. (7) *lamingtoni* sp.n.; (8) *notialis* sp.n.; (9) *lafoae* sp.n.



FIGURES 10–16. *Holothrips* from Australia. Pterothorax and tergites I–II 10–12: (10) *frerei* sp.n.; (11) *speciosissimus*; (12) *oceanicus*. (13) *lafoae* sp.n., tergites I–II. Tergite IX and tube 14–16: (14) *circulus* sp.n.; (15) *federicae* sp.n.; (16) *notialis* sp.n.



FIGURES 17–24. *Holothrips* from Australia. Thoracic sternites 17–18: (17) *australis*; (18) *eurytis* sp.n. Pterothorax and tergites I–II 19–22: (19) *australis*; (20) *federicae* sp.n.; (21) *circulus* sp.n.; (22) *bonyai* sp.n. (23–24) *notialis* sp.n. pelta variation.



FIGURES 25–33. *Holothrips* from Australia. Antenna 25–28: (25) *bunyai* sp.n.; (26) *frerei* sp.n.; (27) *lafoae* sp.n.; (28) *lamingtoni* sp.n. Mouth cone and thoracic sternites 29–30: (29) *oceanicus*; (30) *speciosissimus*. Male sternite VII 31–33: (31) *australis*; (32) *lafoae* sp.n.; (33) *speciosissimus*.

Holoengythrips gen.n.

Diagnosis. Usually apterous; antennae 8-segmented with suture between VII and VIII complete, III with 2 or 3 sensoria, IV with 2, 3 or 4 sensoria; maxillary stylets slender, about 3 microns in diameter, retracted to level of eyes, close together medially for full length of head; head longer than wide, slightly to greatly elevated in midline, usually with a few small cheek setae; mouth cone long, pointed; prosternal basantra absent, mesopre sternum sexually dimorphic; sternopleural sutures present or absent; notopleural sutures complete; pelta with paired campaniform sensilla; fore tarsal tooth present in male, sometimes absent in female; male fore tibia sometimes with an apical or subapical tooth; male tergite IX setae S2 shorter than S1, iS setae relatively long; male sternite VIII with pore plate; tube shorter than head.

Type species *Holoengythrips maynardae* sp.n.

This genus is erected for a group of species from Australia that are similar in general appearance to many *Holothrips* species. That is, they have the maxillary stylets very long and close together medially for the full length of the head, the head is longer than wide and elevated dorsally to a greater or lesser extent, and antennal segments VII and VIII are broadly joined and sometimes form a unit with an almost continuous outline. However, in contrast to *Holothrips* species, the suture between antennal segments VII and VIII is fully complete dorsally and ventrally, the males have a pore plate on sternite VIII, males rarely have any reticulate areas on the intermediate sternites, the maxillary stylets are more slender than in *Holothrips* species, and on tergite IX setal pair iS between setae S1 and S2 are particularly long (Fig. 71). These character states suggest that this new genus is more likely to be related to the genus *Hoplandrothrips* in the *Phlaeothrips*-lineage than to *Holothrips* in the *Docessissophothrips* genus-group (Dang *et al.* 2014).

Sexual dimorphism is well developed among the species of *Holoengythrips*, as it is among the species of *Hoplandrothrips* (Mound & Tree 2013). Not only do males have a larger fore tarsal tooth than females, but the anterior margin of the mesoeusternum is much narrower in males than in females, with associated differences in the mesopre sternum (Figs 56–59). In some of the species the postocular setae of males are not only longer than those of females, but have curiously flattened apices, not the normal capitate apices. Moreover, in some species the males have the major setae on tergites III–V broadly spatulate, in contrast to the normal setae of females. The pore plate on sternite VIII of the males is large in most of the species, but is small and circular in one species. Head shape varies amongst the species of this genus, with two species having the head exceptionally long and elevated medially, although this elevation is less among the other species (Figs 34–42).

Key to *Holoengythrips* species

1. Tergite IX major setae capitate (Fig. 72) [postocular setae capitate, almost as long as eye length; body and legs dark brown, tarsi yellow] *padthawayi* sp.n.
- Tergite IX major setae finely pointed, or rarely bluntly pointed 2
2. Antennal segment III with 2 sensoria 3
- Antennal segment III with 3 sensoria 5
3. Mesoeusternum anterior margin deeply eroded (Fig. 60); mesopre sternum almost absent, represented by two very small lateral sclerites; antennal segment IV with 2 sensoria; male sternite VIII with small circular pore plate medially (Fig. 67) *namadgi* sp.n.
- Mesoeusternal anterior margin entire, often angulate (Figs 56–57); mesopre sternum represented by two lateral triangles; antennal segment IV with 3 or 4 sensoria; where known, male sternite VIII with broadly transverse pore plate (Figs 63–70) 4
4. Antennal segment IV with 4 sensoria; female with fore tarsal tooth shorter than tarsal width; female with mesoeusternal anterior margin weakly angulate and mesopre sternum of two slender triangles (Fig. 59); male mesoeusternal anterior margin narrow and sharply angulate (Fig. 58) *tallagandai* sp.n.
- Antennal segment IV with 3 sensoria; female with fore tarsal tooth longer than tarsal width (Fig. 41); female with mesoeusternal anterior margin clearly angulate and mesopre sternum of two well-defined triangles; male not known *tarsalis* sp.n.
5. Mid and hind femora bicoloured, sharply yellow at apex *maynardae* sp.n.
- Mid and hind femora not sharply bicoloured 6
6. Antennal segments III–VI brown except III yellow at extreme base; male fore tibiae without subterminal tubercle or with small setal-bearing tubercle (Fig. 54) 7
- Antennal segment III extensively yellow; male fore tibiae with prominent subterminal tubercle (Figs 34, 50) 8
7. Tube medially with transverse yellow area; female microptera with minute fore tarsal tooth; male with broad pore plate on sternite VIII (Fig. 64) *kathyae* sp.n.

- Tube brown, paler distally; female microptera with no fore tarsal tooth; male with slender transverse pore plate (Fig. 70) *turcoae* sp.n.
- 8. Male fore tibia with dorsal subapical tubercle (Fig. 50); sternite VIII with narrow transverse pore plate medially (Fig. 66); metanotum reticulate (Figs 45, 48) *monteithi* sp.n.
- Male fore tibia with subapical tubercle on inner lateral margin (Fig. 34); sternite VIII occupied by large pore plate except anteromedially (Fig. 63); metanotum without sculpture (Fig. 43) *barrinei* sp.n.

***Holoengythrips barrinei* sp.n.**

(Figs 34, 43, 51, 61, 63)

Male aptera: Body and legs brown, tarsi and fore tibiae yellow, mid and hind tibiae paler than femora; antennal segment I brown, II–III mainly yellow, IV–VIII brown base of IV paler than apex; major setae pale to weakly shaded, coxal setae dark brown. Head long, slender, dorsal surface without sculpture (Fig. 34), ocelli absent, cheek setae weak, postocular setae longer than eye length with flattened apices; mouth cone not extending to ferna. Antennal segment III with 3 sensoria, IV with 4; IV–VII with parallel-sided pedicel (Fig. 51), VIII slightly narrower at base than VII at apex. Pronotum transverse, with weak median apodeme but no sculpture, 5 pairs of small major setae, epimerals blunt. Fore femora slightly swollen, fore tibia with minute tubercle ventrally at apex and larger conical tubercle sub-apically on inner dorsal margin; fore tarsal tooth as long as tarsal width; fore coxae with several stout setae. Mesonotal setae all small, mesothoracic spiracular area protruding laterally; metanotum with one pair of small major setae, without sculpture (Fig. 43). Prosternal ferna meeting medially; mesoeusternal margin narrow, mesopresternum of three small sclerites (Fig. 61); metathoracic sternopleural sutures weak. Pelta quadrate (Fig. 43); tergites weakly sculptured, with one pair of very small, straight wing-retaining setae; II–IV with one pair of setae broadly expanded and flattened at apex, blunt on V–VIII; tergite IX setae S1 pointed, setae iS longer than S2. Anal setae about as long as tube. Sternites with one row of about 10 minute discal setae; VIII with large pore plate except anteromedially (Fig. 63).

Measurements (holotype male in microns). Body length 1900. Head, length 325; median width 175; postocular setae 85. Pronotum, length 120; median width 250; major setae: am 10, aa 10, ml 12, epim 55, pa 55. Tergite IX setae: S1 110, iS 45, S2 20. Tube length 130. Antennal segments III–VIII length 55, 55, 55, 50, 45, 25.

Material studied. Holotype male aptera, **Queensland**, Cairns, Lake Barrine, from dead branch, 10.x.2012 (LAM 5658).

Comments. The structure of the head and thorax of this species is similar to that of most of the other members of the genus. However, it is unique in the form of the male pore plate, and the tubercle on the fore tibia is also distinctive, although there is also a minute ventro-apical tubercle on the fore tibia, as in *maynardeae*.

***Holoengythrips kathyae* sp.n.**

(Figs 35, 54, 55, 64)

Male microptera: Body, legs and antennae light brown, fore tarsi yellow, also extreme base of antennal segment III; tube with transverse yellow band medially; major setae shaded. Head long, slender (Fig. 35), dorsal surface without sculpture except near eyes and in ocellar triangle, ocelli small; cheek setae small but stout, postocular setae longer than eye length with flattened, recurved apices; mouth cone not extending to ferna. Antennal segment III with 3 sensoria, IV with 4; V–VII with parallel-sided pedicel, VIII slightly constricted at base. Pronotum transverse, with weak median apodeme but no sculpture, 5 pairs of major setae, am acute, remaining pairs blunt to weakly capitate. Fore femora slightly swollen, fore tibia slightly thickened at inner apex; fore tarsal tooth longer than tarsal width; fore coxae with small stout setae. Mesonotal lateral setae well-developed, mesothoracic spiracular area weakly protruding laterally; metanotum with one pair of small major setae, weakly reticulate posteromedially. Fore wing lobe relatively long. Prosternal ferna scarcely meeting medially; mesoeusternal margin narrow, mesopresternum of three small sclerites (Fig. 55); metathoracic sternopleural sutures weak. Pelta subquadrate with rounded anterior margin; tergites weakly sculptured, with two pairs of weakly sigmoid wing-retaining setae; major setae bluntly pointed to weakly capitate; tergite IX setae S1 pointed, setae iS slightly shorter than S2. Anal setae about as long as tube. Sternites with one row of about 12 small discal setae; sternites III–VI of largest males sometimes with paired anterolateral areas of weak reticulation; VIII with pore plate occupying most of median area of sclerite (Fig. 64).

Measurements (holotype male in microns). Body length 2680. Head, length 300; median width 180; postocular setae 85. Pronotum, length 170; median width 300; major setae: am 50(25), aa 60, ml 55, epim 60, pa 40. Fore wing lobe 110. Tergite IX setae: S1 100, iS 50, S2 60. Tube length 160. Antennal segments III–VIII length 78, 75, 70, 60, 50, 25.

Female microptera: Similar to male in colour and structure except, fore tarsal tooth very small, less than half of tarsal width (54); postocular setae capitate and straight; coxal stout setae smaller; mesoeusternal margin transverse; tergite IX setae S1 and S2 pointed; sternites without reticulate areas, VIII with large pore plate (Fig. 64).

Measurements (paratype female in microns). Body length 2250. Tergite IX setae: S1 100, iS 50, S2 110.

Female macroptera: Similar to microptera, fore wing with 9 duplicated cilia; tergites each with 2 pairs of sigmoid wing-retaining setae.

Material studied. Holotype male microptera, **Queensland**, Lamington, O'Reilly's, from *Nothofagus* dead branch, 13.iii.2007 (LAM 5041).

Paratypes, all micropterae: **Queensland**, Lamington, O'Reilly's, 5 females, 4 males from dead branches, 9.x.2006; same locality, 2 females, 2 males from bark spray, 13.iii.2007; 1 male from dead branch, 23.ix.2012; 1 female, 2 males from spraying tree buttress, 4.viii.2013; Springbrook, near Lamington, 4 females, 1 male from bark spray, 29.xi.2011; Mt Gannon, 2 females, 1 male from bark spray, 29.xi.2010; Mt Glorious, 3 females, 3 males, 2007–09; Brisbane, Mt Nebo, 2 females from dead branch, 30.x.2007; Mt Mee, 1 female, 30.x.2010; Westcott, Bunya Mts, 1 female, 5 males, 1 female macroptera from bark spray, 30.xii.2010; Tallegalla Weir Junction, 1 female, 1 male, 22.xii.2011. **New South Wales**, Murwillumbah, Crystal Creek, 2 males from dead leaves, 23.xii.2006.

Comments. The presence of specialized reticulate areas in some of the larger males of this species, anterolaterally on several sternites, is unique among species within this genus. The bicoloured tube distinguishes this species from others in the genus. Four specimens have been studied from Bulburin, NW of Bundaberg that probably represent this species but have the tube darker than the specimens listed above.

Holoengythrips maynardae sp.n.

(Figs 36, 44, 52, 56, 57, 65, 71)

Male microptera: Bicoloured brownish-yellow with posterior abdominal segments darker, fore femora brown, mid and hind femora brown with distal third sharply yellow; mid and hind tibiae brown, tarsi yellow; antennal segments I–II yellow, III–VIII brown but III–IV with basal stem yellow (Fig. 52); major setae brown, coxal setae dark brown. Head long, slender (Fig. 36), dorsal surface without sculpture, ocelli small, cheek setae weak, postocular setae acute and longer than eye length; mouth cone not extending to ferna. Antennal segment III with 3 sensoria, IV with 4; IV–VII with parallel-sided pedicel VIII broadly joined to VII. Pronotum broad, with median apodeme but no sculpture, 5 pairs of pointed major setae. Fore femora swollen, fore tibia angled with small tubercle ventrally at apex, fore tarsal tooth as long as tarsal width; fore coxae with several short stout setae. Mesonotal setae all small, mesothoracic spiracular area protruding; metanotum with one pair of small major setae, without sculpture medially (Fig. 44). Prosternal ferna abutting medially; mesopresternum of two oval sclerites (Fig. 56) meeting sharply angulate mesoeusternal margin; metathoracic sternopleural sutures present. Pelta almost quadrate; tergites with almost no sculpture, with one pair of very small, straight wing-retaining setae; II–IV with one pair of setae broadly expanded and flattened at apex, acute on V–VIII; tergite IX setae S1 acute, about as long as tube, setae iS longer than S2. Anal setae about as long as tube. Sternites with one row of minute discal setae; VIII with pore plate occupying anterior two-thirds of sclerite (Fig. 65).

Measurements (holotype male in microns). Body length 1840. Head, length 275; median width 175; postocular setae 100. Pronotum, length 170; median width 300; major setae: am 35, aa 30, ml 30, epim 45, pa 45. Metanotal median setae 12. Tergite IX setae: S1 95, iS 55, S2 30. Tube length 100. Antennal segments III–VIII length, 65, 60, 60, 50, 45, 30.

Female microptera: Similar to male in colour and structure, except: fore tarsal tooth about half as long as tarsal width; metanotal median setae longer; mesoeusternal margin weakly angulate, mesopresternum of paired lateral triangles (Fig. 57); mesothoracic spiracular area not prominent; tergite marginal setae all pointed.

Measurements (paratype female in microns). Body length 1880. Metanotal median setae 20. Tergite IX setae: S1 105, iS 60, S2 110. Tube length 125.

Material studied. Holotype male microptera, **Norfolk Island**, Red Road, from dead wood, 27.xii.2012 (Alice Wells 66).

Paratypes, all micropterae, **Norfolk Island**: 1 female, 3 males taken with holotype; same locality, from *Toona* dead branch, 1 female, 2 males, 25.xii.2012; Bird Rock Track, 2 females from dead branches, 25–26.xii.2012, 1 female, 1 male, 26.x.2013; Red Road in forest, 2 females, 5 males from fallen *Araucaria* and *Elaeodendron*, 24.xii.2013; Mission Road, 2 females, 1 male from dead branch, 22.xii.2013; Palm Glen, 1 male from dead palm frond, 23.xii.2013; 1 male from dead branch, Highland Lodge, 24.xii.2013.

Comments. Although presumably endemic to Norfolk Island, this species is closely similar to several other species described here in body structure and the form of the male pore plate. It is particularly similar to *kathyae* and *turcoae* from eastern Australia.

***Holoengythrips monteithi* sp.n.**

(Figs 37, 45, 48, 50, 53, 66)

Male aptera: Bicoloured, head yellow with median longitudinal brown marking, body and legs brown except fore tarsi and distal part of fore tibiae yellow; antennal segments largely brown (Fig. 53), III washed with yellow, major setae pale to shaded, coxal setae darker. Head longer than wide, strongly elevated in mid-line (Fig. 37), with weak sculpture, ocelli absent, cheek setae weak, postocular setae longer than eye length; mouth cone not extending to ferna. Antennae relatively slender, segment III with 3 sensoria, IV with 4; V–VII with parallel-sided pedicel, VIII slightly narrowed at base. Pronotum broad, with strong median apodeme but no sculpture, 5 pairs of major setae but am setae small. Fore femora slightly swollen, fore tibia with small tubercle ventrally at apex also one large conical tubercle dorsally near apex (Fig. 50); fore tarsal tooth as long as tarsal width; fore coxae with several short stout setae. Mesonotal setae small; metanotum with one pair of small major setae, reticulate medially, posterior margin elevated (Fig. 48). Prosternal ferna abutting medially; mesoeusternal margin sharply angulate, mesopresternum of two sclerites; metathoracic sternopleural sutures present. Pelta anterior margin rounded (Fig. 48); tergites weakly sculptured, with one pair of straight wing-retaining setae; tergal major setae long and blunt to capitate; tergite IX setae S1 long and blunt, setae iS longer than short stout S2. Anal setae about as long as tube. Sternites with one row of about 10 minute discal setae; VIII with narrow transverse pore plate across median part of sclerite (Fig. 66).

Measurements (holotype male in microns). Body length 2600. Head, length 430; median width 240; postocular setae 100. Pronotum, median length 160; median width 350; major setae: am 35, aa 90, ml 60, epim 90, pa 80. Tergite IX setae: S1 130, iS 55, S2 225. Tube length 160. Antennal segments III–VIII length 80, 75, 72, 70, 55, 35.

Female aptera: Similar to male in colour and structure, except: postocular setae weakly capitate; fore tarsal tooth smaller; mesoeusternal margin weakly angulate, mesopresternum of paired lateral triangles; metanotum reticulate but posterior margin not elevated (Fig. 45).

Measurements (paratype female in microns). Body length 2900. Tergite IX setae: S1 160, iS 60, S2 150.

Material studied. Holotype male aptera, **Queensland**, Mt Moffat, Carnarvon N.P., from bark spray, 16.i.2013 (G. Monteith).

Paratypes: **Queensland**, 1 female, 2 male apterae taken with holotype; Redcliffe Tableland [120km West of Mackay], 1 female aptera from bark spray, 16.iv.2012.

Comments. This is the largest member of the genus, with the antennae longer and more slender than the other species. The head is similar in shape to *barrinei* (Fig. 34), but is even more elevated in the midline (Fig. 37).

***Holoengythrips namadgi* sp.n.**

(Figs 38, 47, 60, 67)

Female aptera. Body and legs brown, tarsi yellowish brown; antennae brown, III yellow at base, major setae shaded. Head longer than wide (Fig. 38), dorsal surface with weak sculpture, ocelli absent, cheek setae weak, postocular setae weakly capitate and longer than eye length; mouth cone not extending to ferna. Antennal segments III and IV each with 2 sensoria; IV–VI with parallel-sided pedicel, VII with broad pedicel, VIII slightly constricted

at base. Pronotum transverse, with no sculpture, am setae pointed, remaining 4 pairs capitate. Fore tarsal tooth minute, at inner apex. Mesonotal setae all small; metanotum with one pair of small major setae, without sculpture medially (Fig. 47). Prosternal ferna not meeting medially; mesopresternum of two small lateral sclerites, mesoeusternal margin eroded medially (Fig. 60); metathoracic sternopleural sutures present. Pelta anterior margin rounded (Fig. 47); tergites with almost no sculpture, with one pair of very small, straight wing-retaining setae; major setae on II–VIII weakly capitate; tergite IX setae S1 and S2 pointed. Anal setae about as long as tube. Sternites with one row of about 6 discal setae.

Measurements (holotype female in microns). Body length 1950. Head, length 225; median width 170; postocular setae 55. Pronotum, length 130; median width 225; major setae: am 20, aa 35, ml 20, epim 30, pa 35. Tergite IX setae: S1 60, iS 35, S2 60. Tube length 100. Antennal segments III–VIII length 50, 50, 50, 45, 40, 20.

Male aptera: Similar to female in colour and structure except, postocular setae finely pointed, fore tarsal tooth about half as long as tarsal width; sternite VIII with small, sub-circular pore plate medially (Fig. 67).

Measurements (paratype male in microns). Body length 1300. Tergite IX setae: S1 35, iS 30, S2 20.

Material studied. Holotype female aptera, **Australian Capital Territory**, Namadgi, from dead twigs with lichen, 27.xii.2005 (LAM 4784).

Paratypes: **Australian Capital Territory**, 2 male apterae taken with holotype; **Tasmania**, Buckland, Pulchella garden, 1 male aptera from dead branch, 27.xi.2010; **Queensland**, Cairns, Barron Gorge, 1 male aptera from dead branch, 6.xi.2008.

Comments. This species differs from most of the others in this genus in the shorter head, broader pedicel on antennal segment VII, and the small, sub-circular male pore plate (Fig. 67). The range over which these few specimens have been taken, from Tasmania to Cairns, is remarkable, and suggests that this species is wind dispersed despite being apterous.

Holoengythrips padthawayi sp.n.

(Figs 40, 62, 68)

Male macroptera: Body and legs brown, tarsi yellow; antennal segment I and base of II brown, III–V largely yellow with apices weakly shaded, VI–VIII light brown; fore wings pale; major setae all pale. Head longer than wide (Fig. 40), dorsal surface weakly sculptured, ocelli well-developed, cheek setae weak, postocular setae weakly capitate and almost as long as eye; mouth cone not extending to ferna. Antennal segment III with 1 sensorium, IV with 3 sensoria; apex of V asymmetric, VIII slightly narrower at base than VII at apex. Pronotum transverse, weakly sculptured at anterior and posterior margins; major setae small and weakly capitate but am setae finely acute. Fore tarsal tooth large, almost as long as tarsal width; fore tibia with no tubercle. Mesonotal lateral small and capitate; metanotum weakly reticulate, with one pair of fine major setae. Fore wing parallel-sided, with about 4 duplicated cilia; sub-basal setae short. Prosternal ferna not meeting medially; mesopresternum of three small sclerites, anterior margin of mesoeusternal transverse (Fig. 62); metathoracic sternopleural sutures long. Pelta triangular, reticulate, tergites II–VII with two pairs of wing-retaining setae; major setae on II–VIII capitate; tergite IX setae S1, S2, and S3 all capitate. Anal setae shorter than tube. Sternites with one row of about 10 small discal setae, IV–VI with faintly indicated areas of specialized reticulation, VIII with large pore plate that is narrowed medially (Fig. 68).

Measurements (holotype male in microns). Body length 2300. Head, length 300; width behind eyes 200; postocular setae 70. Pronotum, length 150; median width 350; major setae: am 10, aa 30, ml 30, epim 45, pa 35. Tergite IX setae: S1 125, iS 35, S2 75, S3 125. Tube length 180. Antennal segments III–VIII length 75, 70, 60, 55, 50, 30.

Material studied. Holotype male macroptera, **South Australia**, Desert Camp Park, [20km north of Padthaway], from dead wood, 3.x.2013 (DJT 1677).

Comments. The head of the only known specimen is slightly crushed (Fig. 40), and uncrushed would probably be more like that of *kathyae* (Fig. 35). The pore plate on sternite VIII is of an unusual shape (Fig. 68), and the apices of all three pairs of major setae on tergite IX are strongly capitate (Fig. 72), in contrast to all other members of the genus.

***Holoengythrips tallagandai* sp.n.**

(Figs 39, 58, 59, 69)

Female macroptera: Body and legs brown, mid and hind femora paler distally, tarsi yellowish brown; antennal segment I and base of III yellowish brown, II light brown, remaining segments brown, major setae shaded. Head much longer than wide (Fig. 39), dorsal surface almost without sculpture, ocelli well-developed, cheek setae weak, postocular setae pointed and shorter than eye length; mouth cone not extending to ferna. Antennal segment III with 2 sensoria, IV with 4 sensoria; IV–VII with parallel-sided pedicel, VIII slightly constricted at base. Pronotum transverse, with no sculpture, 5 pairs of pointed major setae. Fore tarsal tooth pointed, less than half as long as tarsal width. Mesonotal lateral setae longer than posterior pairs; metanotum with one pair of small major setae, without sculpture medially. Fore wing parallel-sided, with 6 or 7 duplicated cilia; sub-basal setae short, variable in length and number. Prosternal ferna scarcely meeting medially; mesopre sternum of two slender sclerites, mesoeusternal margin weakly angulate (Fig. 59); metathoracic sternopleural sutures present. Pelta anterior margin rounded; tergites with almost no sculpture, II–VII with two pairs of wing-retaining setae; major setae on II–VIII pointed; tergite IX setae S1 and S2 pointed. Anal setae shorter than tube. Sternites with one row of about 10 small discal setae.

Measurements (holotype female in microns). Body length 2000. Head, length 275; median width 175; postocular setae 60. Pronotum, length 110; median width 250; major setae: am 25, aa 25, ml 25, epim 55, pa 40. Tergite IX setae: S1 100, iS 35, S2 110. Tube length 130. Antennal segments III–VIII length 60, 55, 55, 52, 48, 30.

Female microptera: similar to macroptera but wing-retaining setae short and straight.

Male microptera: Similar to female in colour and structure except, fore tarsal tooth longer than tarsal width, fore femora slightly swollen, fore coxae with several short stout setae; mesothoracic spiracular area prominent; mesoeusternal margin sharply angulate (Fig. 58), mesopre sternum of two strongly divergent triangles; sternite VIII with pore plate occupying anterior two-thirds of sclerite (Fig. 69).

Measurements (paratype male in microns). Body length 2500. Tergite IX setae: S1 100, iS 35, S2 50.

Material studied. Holotype female macroptera, **New South Wales**, Tallaganda, Lowden Forest Park, from dead *Eucalyptus*, 9.ii.2013 (LAM 5736).

Paratypes: 3 female macropterae taken with holotype. **Australian Capital Territory**, Black Mt., from dead branch, 1 male microptera, 28.viii.1995, 1 male microptera, 26.ii.2011. **Victoria**, Nelson, 1 male microptera from *Acacia* dead twigs, 13.iii.2011. **Queensland**, Lamington, O'Reillys, 1 male from dead leaves, 11.x.2006.

Comments. This species is very similar in body structure to *maynardae*, but it is uniformly dark brown, has only two sensoria on the third antennal segment, and the male lacks a tubercle at the apex of the fore tibia.

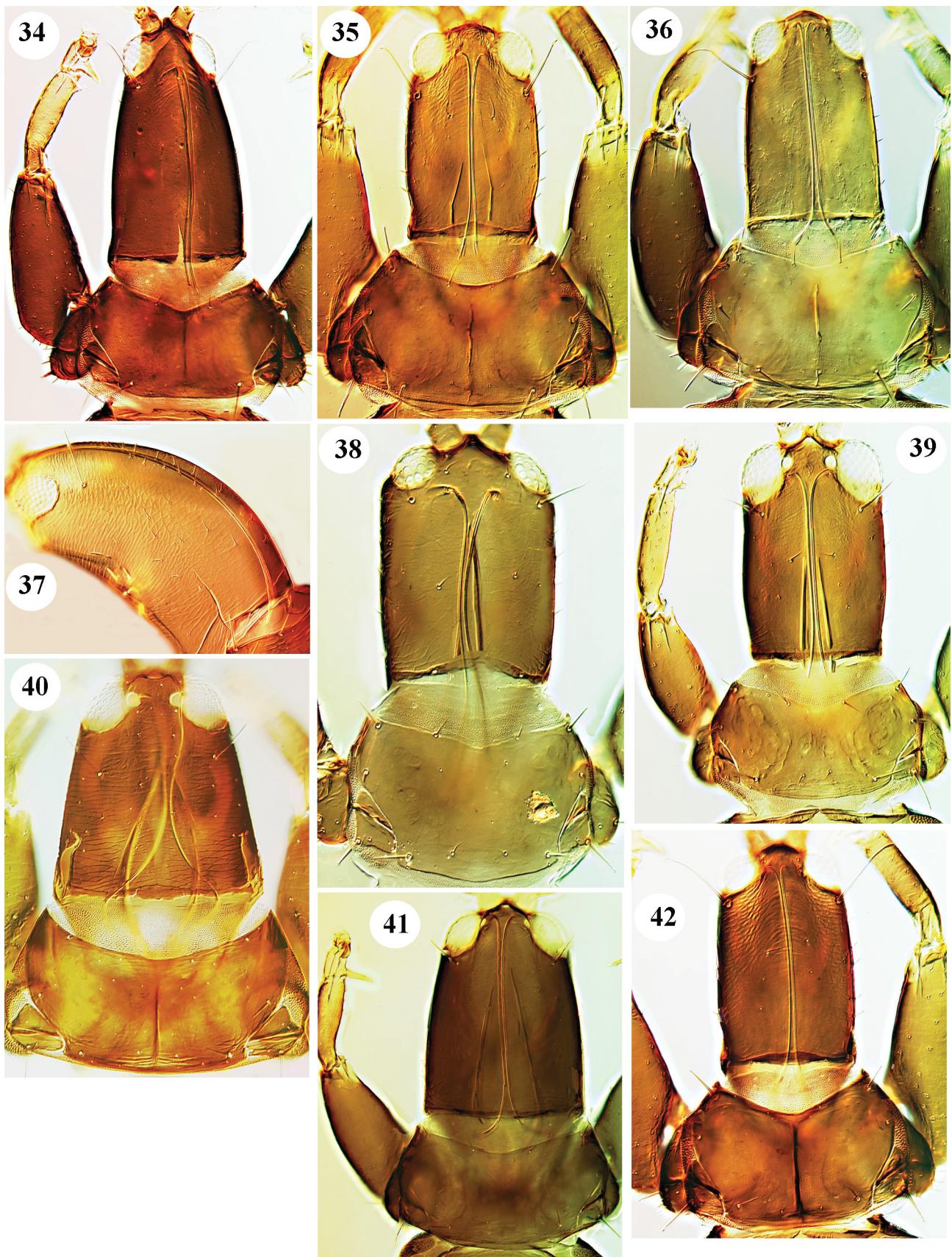
***Holoengythrips tarsalis* sp.n.**

(Fig. 41)

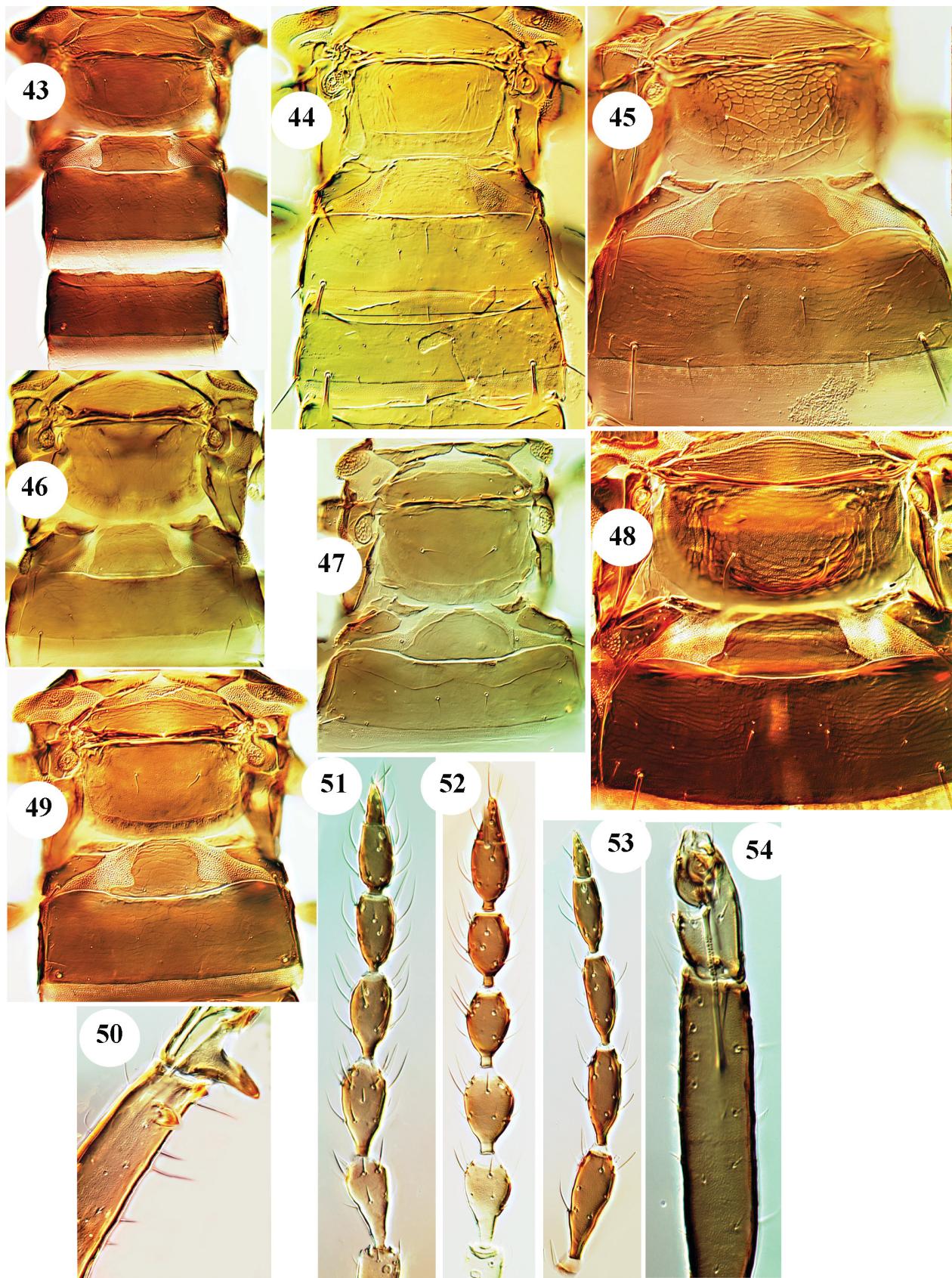
Female microptera: Body and legs brown, tarsi yellow; antennal segment I yellow, II light brown, III–V yellow at base, V–III brown, major setae shaded. Head much longer than wide, dorsal surface almost without sculpture (Fig. 41), ocelli small, cheek setae very weak, postocular setae weakly capitate, shorter than eye length; mouth cone just extending to ferna. Antennal segment III with 2 sensoria, IV with 3 sensoria; IV–VII with parallel-sided pedicel, VIII broadly joined to VII. Pronotum transverse, with no sculpture, 5 pairs of short, bluntly pointed major setae. Fore tarsal tooth acute, nearly as long as tarsal width (Fig 41). Mesonotal setae small; metanotum with one pair of small major setae, without sculpture medially. Prosternal ferna not meeting medially; mesopre sternum of two slender sclerites, mesoeusternal margin almost straight; metathoracic sternopleural sutures present. Pelta subquadrate; tergites with almost no sculpture, major setae on II–VIII pointed; tergite IX setae S1 and S2 long and finely pointed. Anal setae shorter than tube. Sternites with one row of about 10 small discal setae.

Measurements (holotype female in microns). Body length 1900. Head, length 300; median width 225; postocular setae 50. Pronotum, length 135; median width 280; major setae: am 20, aa 20, ml 20, epim 45, pa 30. Wing lobe 30. Tergite IX setae: S1 100, iS 45, S2 95. Tube length 110. Antennal segments III–VIII length 55, 50, 50, 50, 45, 25.

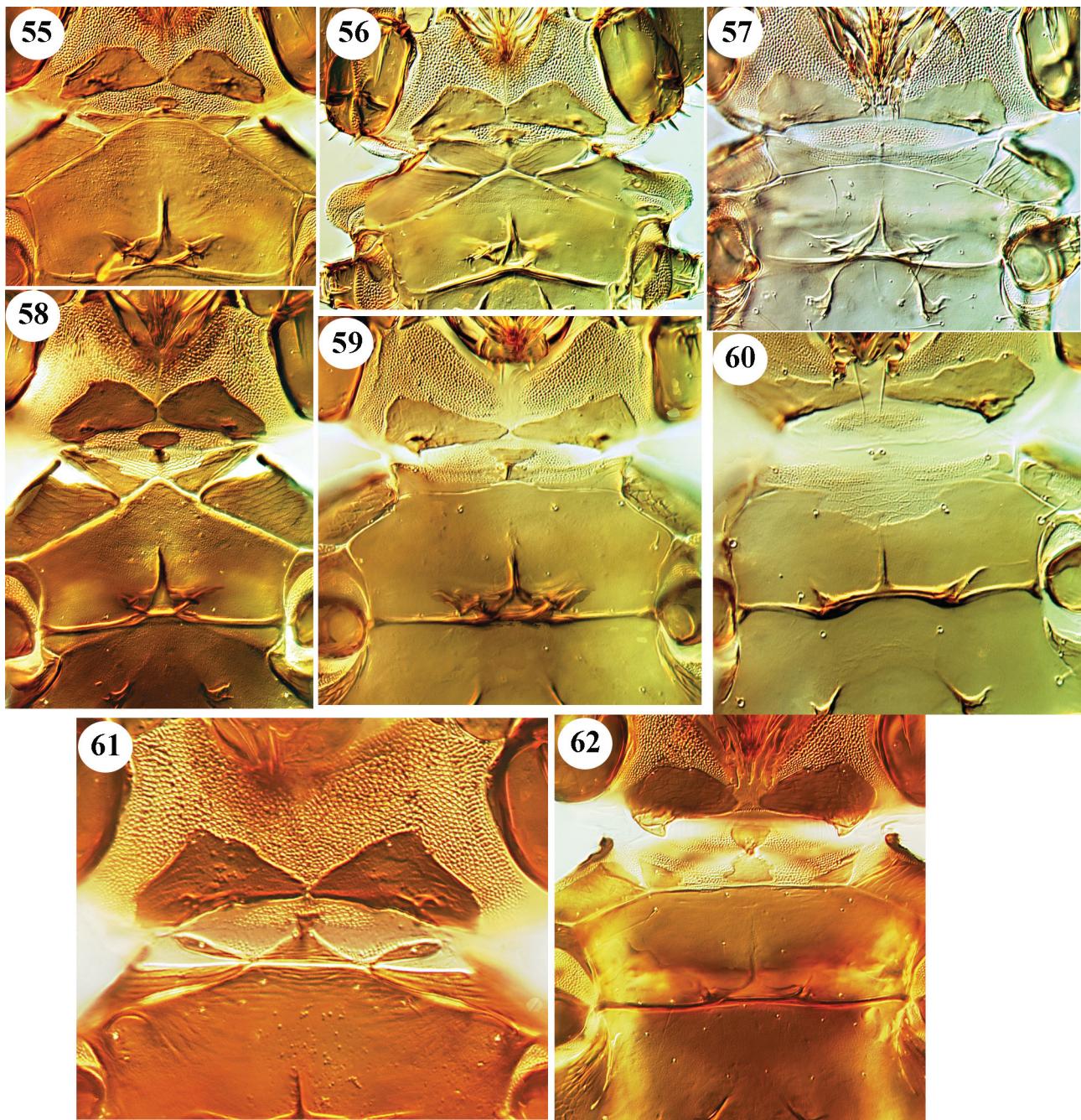
Male: not known.



FIGURES 34–42. *Holoengythrips* from Australia. Heads: (34) *barrinei* sp.n.; (35) *kathyae* sp.n.; (36) *maynardaee* sp.n.; (37) *monteithi* sp.n.; (38) *namadgi* sp.n.; (39) *tallagandai* sp.n.; (40) *padthawayi* sp.n.; (41) *tarsalis* sp.n.; (42) *turcoae* sp.n.



FIGURES 43–54. *Holoengythrips* from Australia. Pterothorax and abdominal tergites 43–49: (43) *barrinei* sp.n.; (44) *maynardeae* sp.n., male; (45) *monteithi* sp.n., female; (46) *tarsalis* sp.n.; (47) *namadgi* sp.n.; (48) *monteithi* sp.n., male; (49) *turcoae* sp.n. (50) *monteithi* sp.n., fore tarsus and tibia. Antenna 51–53: (51) *barrinei* sp.n.; (52) *maynardeae* sp.n.; (53) *monteithi* sp.n. (54) *kathyae* sp.n., female fore tarsus and tibia.

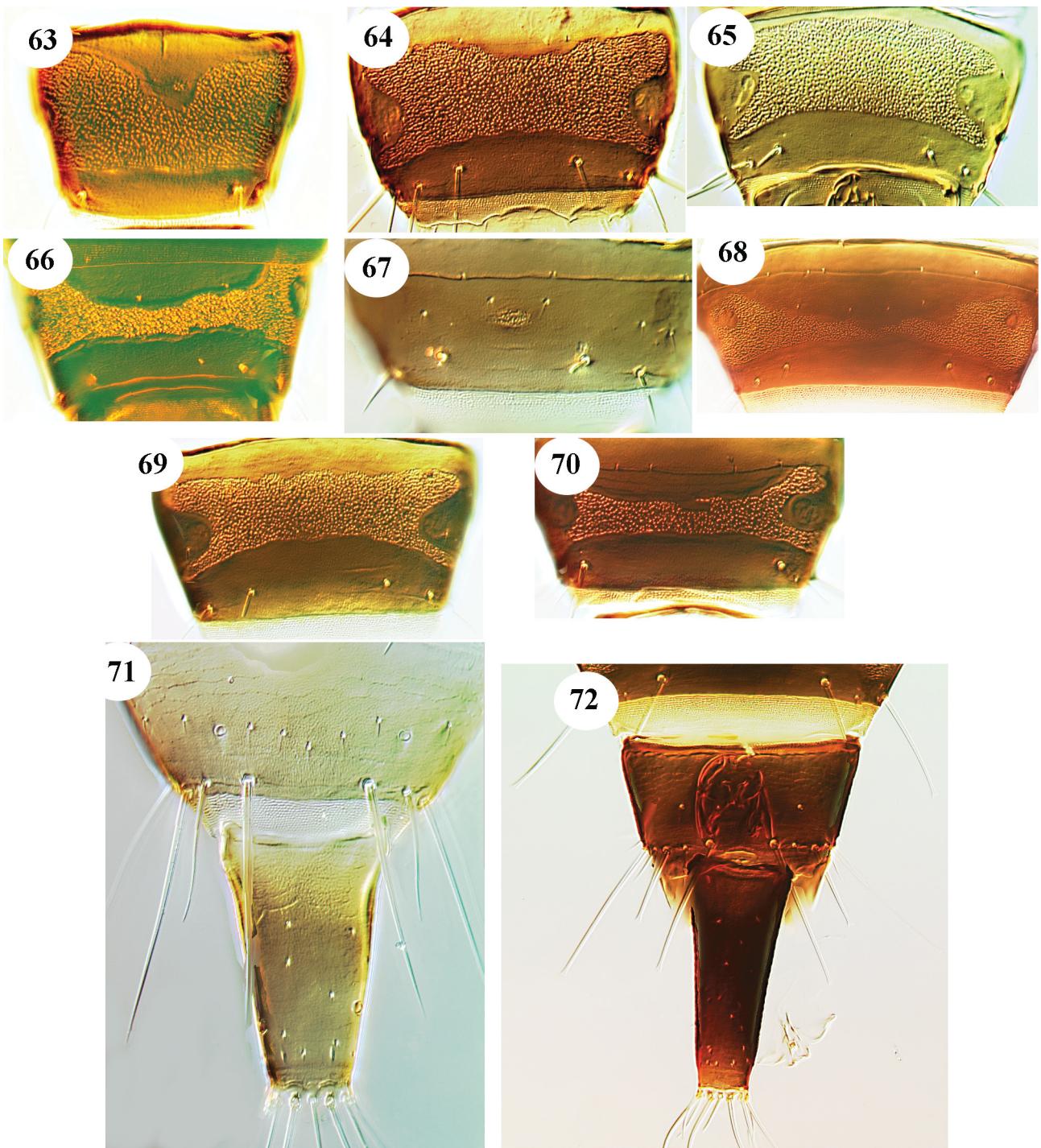


FIGURES 55–62. *Holoengythrips* from Australia. Pterothoracic sternites: (55) *kathyae* sp.n.; (56) *maynardae* sp.n., male; (57) *maynardae* sp.n., female; (58) *tallagandai* sp.n., male; (59) *tallagandai* sp.n., female; (60) *namadgi* sp.n.; (61) *barrinei* sp.n.; (62) *padthawayi* sp.n.

Material studied. Holotype female microptera, **New South Wales**, Walcha, from *Helichrysum* leaf, 28.xii.2000 (LAM 3997).

Paratypes: **Queensland**: Brisbane, Mt Glorious, 1 female microptera from dead branch, 19.i.2006; Aldershot, 1 female microptera from *Eucalyptus* bark spray, 18.vii.2011.

Comments. Each of the three micropterae has a very small wing lobe that does not bear any long setae, and each of them also has three ocelli present. Although similar in body structure to *tallagandai*, this species has three sensoria on the fourth antennal segment and the female fore tarsal tooth is longer.



FIGURES 63–72. *Holoengythrips* from Australia. Male sternite VIII pore plate 63–70: (63) *barrinei* sp.n.; (64) *kathyae* sp.n.; (65) *maynarda* sp.n.; (66) *monteithi* sp.n.; (67) *namadgi* sp.n.; (68) *padthawayi* sp.n.; (69) *tallagandai* sp.n.; (70) *turcoae* sp.n. Tergite IX and tube, 71–72: (71) *maynarda* sp.n., female; (72) *padthawayi* sp.n., male.

***Holoengythrips turcoae* sp.n.**

(Figs 42, 49, 70)

Male microptera: Body, legs and antennae brown, fore tarsi paler, also extreme basal quarter of antennal segment III; tube brown paler distally; major setae brown to dark brown. Head long, slender (Fig. 42), dorsal surface without sculpture except behind eyes, ocelli small; cheek setae small, postocular setae longer than eye length with

flattened, recurved apices; mouth cone not extending to ferna. Antennal segment III with 3 sensoria, IV with 4; VI–VII with parallel-sided pedicel, VIII slightly constricted at base. Pronotum transverse, with median apodeme but no sculpture, 4 pairs of major blunt to weakly capitate setae, am minute. Fore femora slightly swollen, fore tibia with minute ventro-apical tubercle, also with subapical rounded tubercle bearing a seta on inner dorsal margin; fore tarsal tooth as long as tarsal width; fore coxae with short stout setae. Mesonotal setae small, mesothoracic spiracular area protruding laterally (Fig. 49); metanotum with one pair of small major setae, without sculpture medially. Fore wing lobe small, without major setae. Prosternal ferna scarcely meeting medially; mesoeusternal margin narrow, mesopresternum of three small sclerites; metathoracic sternopleural sutures weak. Pelta with rounded anterior margin and short lateral wings; tergites weakly sculptured, with two pairs of short straight wing-retaining setae; major setae bluntly pointed to weakly capitate; tergite IX setae S1 bluntly pointed, setae iS longer than short stout S2. Anal setae shorter than tube. Sternites with one row of about 12 small discal setae; sternites III–IV with paired areas of scarcely visible reticulation; VIII with transverse pore plate across middle of sclerite (Fig. 70).

Measurements (holotype male in microns). Body length 2000. Head, length 270; median width 170; postocular setae 105. Pronotum, length 135; median width 250; major setae: am 6, aa 50, ml 35, epim 50, pa 30. Fore wing lobe 35. Tergite IX setae: 100, iS 50, S2 30. Tube length 135. Antennal segments III–VIII length 70, 60, 55, 50, 45, 30.

Female microptera: Similar to male in colour and structure except, fore tarsal tooth absent; postocular setae capitate and straight; coxal stout setae smaller; mesoeusternal margin transverse; tergite IX setae S1 and S2 bluntly pointed; sternites without reticulate areas or pore plate.

Measurements (paratype female in microns). Body length 2200. Tergite IX setae: S1 85, iS 60, S2 100.

Material studied. Holotype male microptera, **Queensland**, Mt Bartle Frere, from bark spray, 19.xi.2009 (Monteith & Turco).

Paratypes: 4 female micropterae taken with holotype.

Non-paratype: Bulburin, [120km NW of Bundaberg], 1 female macroptera, from bark spray, 11.vii.2012.

Comments. The macropterus female listed from Bulburin is possibly this species, but has a very tiny fore tarsal tooth, and the pelta lacks posterolateral wings.

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